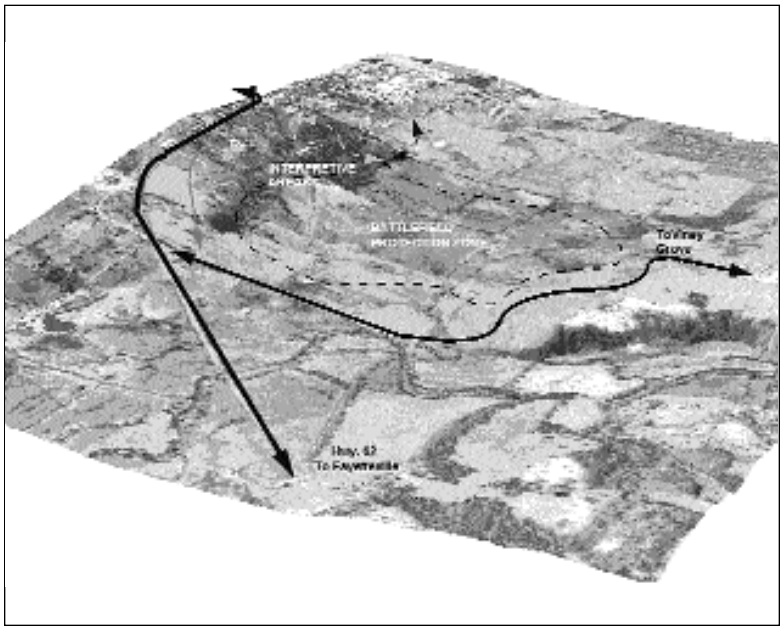
R. Brian Culpepper

Better Planning Through GIS
Battlefield Management Efforts at CAST

In April 1992, the Center for Advanced Spatial Technologies (CAST) developed a Geographic Information System (GIS) and maps that related current location and land use statistics for 98 Civil War battlefields. This initial project, completed September 1993, helped the Civil War Sites Advisory Commission assess the present day condition of America's Civil War battlefields.

Following this initial report, the National Park Service (NPS) contracted with CAST to enhance the GIS analysis completed previously at the Prairie Grove battlefield in Arkansas. The goal of the project was to assess the visual integrity of the battlefield, identify important viewsheds, and model (using computer imaging programs) potential impacts of demographic changes on the integrity of the battlefield, part of which lies in a state park. The GIS allowed the National Park Service to "objectively" analyze the historic landscape. The system could answer queries, for instance, as to what a visitor might see from any location on the battlefield, not just within the protected state park; the number of modern visual intrusions visible from current tour stops and viewing locations; how the view would change if a tour stop was moved to another location; and what kind of development potential a proposed interpretative location would have. The beauty of the GIS system was its ability to assimilate historical documents, photographs, physical features, land ownership records, soil types, vegetation types, locational data, and descriptions of cultural features in one computer program.

Computer modeling of the Prairie Grove battlefield helped planners predict how their decisions would affect the landscape. Illustration courtesy CAST.



In September 1994, the NPS awarded two additional projects to CAST: one to develop a master plan for Prairie Grove Battlefield State Park and a second to define a program of uses to guide the development and operations at the Honey Springs Historic Park in Oklahoma. The proposed program of uses would determine the best size and location for each capital improvement at the battlefield.

Technology and Planning at Prairie Grove

The Arkansas Department of Parks and Tourism (ADPT) presented its *Prairie Grove Battlefield Protection Plan* to the NPS's American Battlefield Protection Program (ABPP) in 1991. This plan identified parcels of land that would be protected by fee simple acquisition or by conservation easements. The ADPT was prepared to develop a master plan for the park. By 1994, a collaborative effort among CAST, the ADPT, and the ABPP began to take shape. CAST and the ADPT worked within the guidelines established by the ABPP to develop a master plan for the battlefield park. Karen Hanna, a registered landscape architect and Director of the Landscape Architecture Department at the University of Arkansas, Fayetteville, served as co-principal investigator. Hanna's many years of park planning and multidisciplinary project experience were essential to the success of the process.

After assessing the accuracy of the existing GIS database, some additional data was developed to support the master planning process. Assessment of the GIS data was imperative because much of the original data was collected to support a regional study for the battlefield, but master plans typically require more accurate and detailed information.

Additional data collection efforts were guided by the goals of the master plan as determined by the project coordinators. These goals were:

- to protect historic resources (such as artifacts and the battlefield's visual setting);

- to provide interpretive programs (about the battle and pre- and post- battle life using signage, museum programs and displays, tours, and re-enactments);
- to provide regional recreation (fairs, running events, group picnics, group meetings and presentations);
- to provide local recreation (such as picnic areas, a playground, trails for walking, jogging, and automobile tours); and
- to provide economic support to the town of Prairie Grove (by promoting the town's historical and architectural resources, local restaurants, hotels, bed & breakfasts, and other businesses)

These goals were followed when determining the program of uses for the future of the Prairie Grove Battlefield State Park. "Program of uses" is landscape architecture terminology for a facilities requirements check list. The ADPT's program analyzed proposed facilities for:

- preservation enhancement (undisturbed battlefield, historic zones, viewsheds);
- interpretation (historic significance, important sites and buildings); and
- regional and local recreation (open areas, picnic areas, playgrounds, trails, roads, pavilions, meeting rooms, stage)

The physical characteristics of the battlefield landscape had to be considered before facilities could be sited at the best location. Traditional site analysis would have been conducted by drafting by hand maps of the physical aspects of the landscape. This spatial information was already in the GIS and quickly could be queried by the design team. The site analysis considered these physical conditions of the battlefield:

- natural features (such as slope, floodplains, vegetation types, microclimate conditions, soil types, and drainage patterns); and
- cultural features (including historic rank, viewsheds, land ownership, buildings and structures, access, development pressure, and proposed sewer easements).

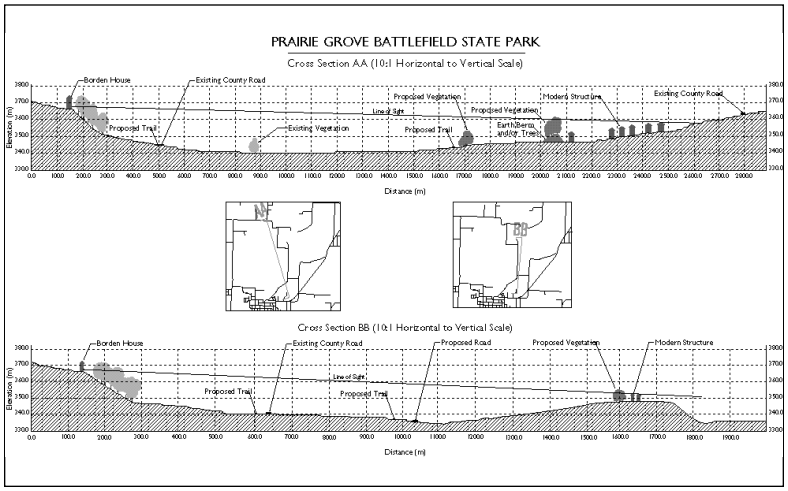
The synergetic capabilities of the GIS allowed planners to combine the program of uses and the site analysis to create an Area Relationship Study (ARS). The ARS is essentially a "best fit" map that matches proposed uses to the most appropriate locations. The ARS results in a specific land use map that places future uses in those areas most beneficial to the physical, cultural, and historical contexts of the battlefield. Karen Hanna presented the battlefield land use plan (ARS) at community meetings to gather public input and acceptance for the new uses before details such as paint colors, path materials, and signage clouded the issue of the management plan's acceptance.

The GIS provided the tools for considering all options before presenting the findings to the public, and it allowed the project team to clearly display the proposals with maps and 3-dimensional views that the public could understand. Based upon the project team's experience, the public clearly understood how the planning process evolved and why the development of the park should be based on the proposed plan. Clear communication, facilitated by the use of a visual technology, helped the ADPT gain additional public support for the project.

The proposed master plan for the Prairie Grove State Park addressed and responded to three major components laid out by the project team: acquisition of new lands and easements; improvements to the park core; and improvements to the driving tour.

Acquisition of New Lands and Easements. Historical analysis determined four levels of historic significance relative to events before, during, and after the battle. In addition, a more intense visual analysis identified important viewsheds from the primary viewing points. These two studies identified parcels needing acquisition or easement. The master plan called for fee acquisition of approximately 70 acres of land immediately north and east of the park, and for conservation easements on 800 acres.

Improvements to the Park Core. The core of the park suffered from a poor vehicular circulation pattern, inadequate walking paths, insufficient parking, inadequate maintenance facilities, and a visitor information center that was inappropriate in scale and character to the rest of the park. The proposed master plan called for better buffers to separate the adjacent highway from the park, internalize the park traffic patterns, and better focus the visitor's experience on the Civil War events. Other proposed site improvements included additional interpretive trails, a system of



Cross-sections of the Prairie Grove battlefield generated in the GIS were used to depict how proposed vegetation and earthen berms would screen modern visual intrusions. Drawing courtesy Arkansas Department of Parks and Tourism.

walks to connect all park features, an interpretive station in the "historic village," new restrooms at the Borden House and the amphitheater, and additional parking spaces.

Improvements to the Driving Tour. The proposed master plan rerouted the driving tour to improve views and interpretive opportunities. New driving tour stops along the periphery of the battlefield will have panoramic views of the field of action. The tour continues from the park into downtown Prairie Grove, drawing visitors to the commercial areas of town. A proposed walking/driving tour of the town will include many of the historic and architecturally significant buildings.

The master plan was completed using traditional planning methods combined and conducted within a Geographic Information System. The Arkansas Department of Parks and Tourism is currently implementing Phase I of the master plan, which includes the fee simple acquisition of approximately 203 acres of land primarily north and east of the park and the purchase of conservation/scenic easements on another 206 acres. Additionally, the ADPT is securing the "right of first refusal" on 356.5 acres. Lands chosen for protection are highly significant, comprise viewsheds visible from the park, and are prime for interpretation. Completion of Phase I will result in a total of 1,069.67 acres protected (including the park).

The Honey Springs Battlefield Master Plan is nearing completion and was also conducted by this author and Karen Hanna, in cooperation with the Oklahoma Historical Society and the National Park Service. The master plan methodology was altered slightly from the Prairie Grove model because the Honey Springs battlefield had little existing park infrastructure or facilities. Once a standard but flexible GIS model is established for battlefield preservation and management planning, it can be applied efficiently to other sites. CAST encourages battlefield preservationists to consider this technological tool in their inventory and planning efforts.

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Mapping Battlefields

Anyone who has walked across a battlefield understands that the significance of the ground is not always apparent. A cornfield might look commonplace, for example, until someone points out that a regiment advanced across it, taking heavy casualties. Cannoneers served their guns from that unexceptional hillock. Soldiers crouched there in the sunken bed of an old mill road. Battles were ephemeral events, often occurring within the space of a few hours. Units maneuvered across the landscape, soldiers fired at one another, and soldiers died. The armies passed on, leaving a blood-stained field to be tilled or to grow into a thicket or to be built upon by the generations that followed.

Battlefield resources are often obscured by time and difficult to locate. That is why many historians dedicate years to researching a particular battle. The site of a battlefield is determined by a combination of identified historic features (e.g., structures, road traces, and stone fences), by terrain features, by archeological investigation, and by archival research in reports, memoirs, and historic maps.

Since 1990, the Cultural Resources GIS Facility (CRGIS) of the National Park Service has combined historic research and computer technology to put battlefield resources on the map. Often working directly from Civil War-era maps, CRGIS surveyors return to battlefields to find the roads, house sites, earthworks, and other features depicted by military cartographers. These features are mapped using Global Positioning Systems (GPS) technology, which is a tool to transfer field observations into a spatial database that can be manipulated by computers. The manipulation is done in a Geographic Information System (GIS), a software program that allows the user to integrate text, images, and spatial information and to analyze relationships among landscape features.

To date, CRGIS has applied this methodology on ten major battlefields, mapping in the process nearly 90 miles of surviving Civil War fortifications and countless other surviving resources. The goal of these efforts is to extract the information that historians have in their heads, place it on a map, and put it on the desktops of preservation planners and resource managers. CRGIS is building a national inventory of battlefield resources one site at a time. In the future, when a historian retires or transfers, his or her knowledge of the resources will stay behind in the computer's memory. Planners and resource managers that follow will build upon the historian's knowledge to preserve the essential battlefield landscape for future generations.

—David W. Lowe
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